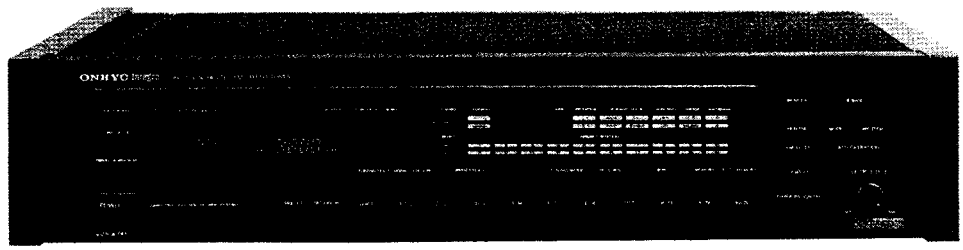
ONKY-00416

SERIAL No. 3275

ONKYO SERVICE MANUAL

SYNTHESIZED
FM STEREO TUNER

MODEL T-9990



SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK ⚠ ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PARTS NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

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ONKYO
AUDIO COMPONENTS

SPECIFICATIONS

Tuning Range:	87.5 – 108.0MHz (AUTO MODE 50kHz steps, MANUAL MODE 25kHz steps)
Usable Sensitivity:	Mono: 0.8μV (S/N 26dB, 40kHz Dev.) DIN Stereo: 20.0μV, (S/N 46dB, 40kHz Dev.) DIN
50dB Quieting Sensitivity:	Mono: 15.8dBf, 1.7μV Stereo: 37.2dBf, 20μV
Capture Ratio:	1.0dB
Image Rejection Ratio:	100dB
IF Rejection Ratio:	100dB
Signal-to-Noise Ratio:	Mono: 95dB (IHF) Stereo: 85dB (IHF)
Selectivity:	80dB (±300kHz, IF: super narrow)
AM Suppression Ratio:	60dB
Total Harmonic Distortion:	Mono: 0.009% (IF: wide) Stereo: 0.02% (IF: wide)
Frequency Response:	30 – 15,000Hz (+0.5dB, –1.0dB)
Stereo Separation:	55dB at 1kHz (IF: wide) 33dB at 70 – 10,000Hz (IF: wide)
Output Voltage:	0 – 1.5V
Dimensions (W × H × D):	465 × 103 × 387mm 18-5/16" × 4-1/16" × 15-1/4"
Weight:	8.5kg, 18.7lbs.

Specifications and features are subject to change without notice.

SERVICE PROCEDURES

1. Replacing the lamp

This unit uses the lamp listed below.

Circuit no.	Parts no.	Desciption
Q754	210064A	PL 6.3V, 250mA, Dial plate illumination

2. Memory Preservation

This unit does not require memory preservation batteries. A built-in memory power back-up system preserves contents of the memory during power failures and even when the unit is unplugged. The unit must be plugged in and the power switch turned on and off once in order to charge the back-up system. Note that since this is not a permanent memory, the power switch must be turned on and off a few times each month to keep the back-up system operable. The period of time during which memory contents are preserved after power has last been turned off varies depending on climate and the location and placement of the unit. On the average, memory contents are protected over a period of 3 to 4 weeks (a minimum of 2 weeks) after the last time power has been turned off. This period is shorter when the unit is exposed to very high humidity or used in an area with an extremely humid climate.

3. Procedures for replacement of flat packaged ICs

1. **Tools to be used:**

(1) **Soldering iron** .... Grounded soldering iron or soldering iron with leak resistance of 10 Mohms or more.

Form of soldering iron's tip:

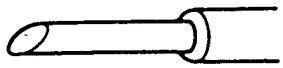


Fig. 1

(2) **Magnifying glass** ... for checking of finished works

(3) **Tweezers** ..... for handling of IC and forming of leads

(4) **Grounding ring** .... Countermeasure for electrostatic breakdown

(5) **Nipper** ..... for removing defective IC

(6) **Small brush** ..... for application of flux

2. Work Procedures:

(1) **Remove the defective IC**
Cut all leads of the defective IC one by one using a nipper and remove the IC.

(2) **Clean the pattern surface of the PC board.**
Get rid of the remaining leads and solder.

(3) Check and from the leads of the new flat packaged IC to be installed.
From every lead on the new IC using a pair of tweezers, so that all of them are aligned neatly without being risen, twisted or inclined toward one side. Especially the rising portion of every lead must be formed with greatest care.

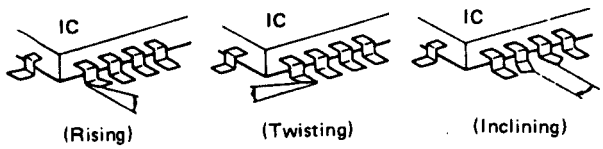


Fig. 2

(4) **Apply flux to the PC board.**
Apply flux to the pattern surface of the PC board which has been cleaned, as shown in the illustration. The area to be applied with flux is the portion of about 2.5mm in width where the IC's leads are to be soldered.
Be careful to apply minimum amount of flux required so as not to smear it on unwanted areas.

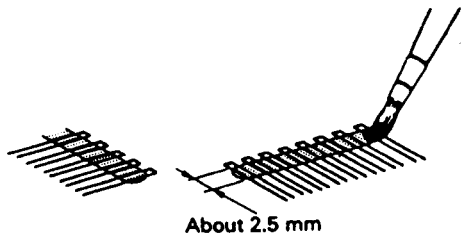


Fig. 3

(5) **Temporarily tighten the IC**
Carefully align the pattern and IC's leads, so that the IC will be temporarily tightened to the pattern on the four leads at the corners. At this time, soldering is required, but no need to apply soldering material.

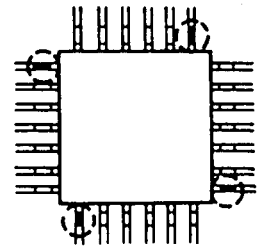


Fig. 4

(6) **Apply flux to IC's leads**
Apply flux to the areas of IC's leads where soldering is to be performed. Be careful not to smear flux on the root portion of any lead or the body of IC.

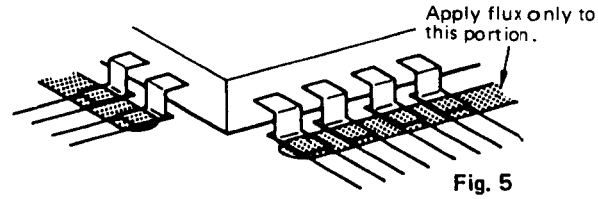


Fig. 5

(7) **Soldering**
While attaching the tip of the soldering iron to the soldering point as shown in the illustration, feed 2 –5mm of soldering wire. Then, slowly move the iron in the direction indicated by the arrow in the illustration, so that the leads will be soldered to the pattern. Move the iron in the rate of approximately 1cm in 5sec. Proceed with your work while confirming a clean fillet of solder is formed on each lead, subsequent to the melting of flux.

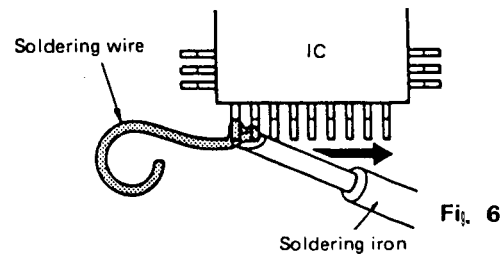


Fig. 6

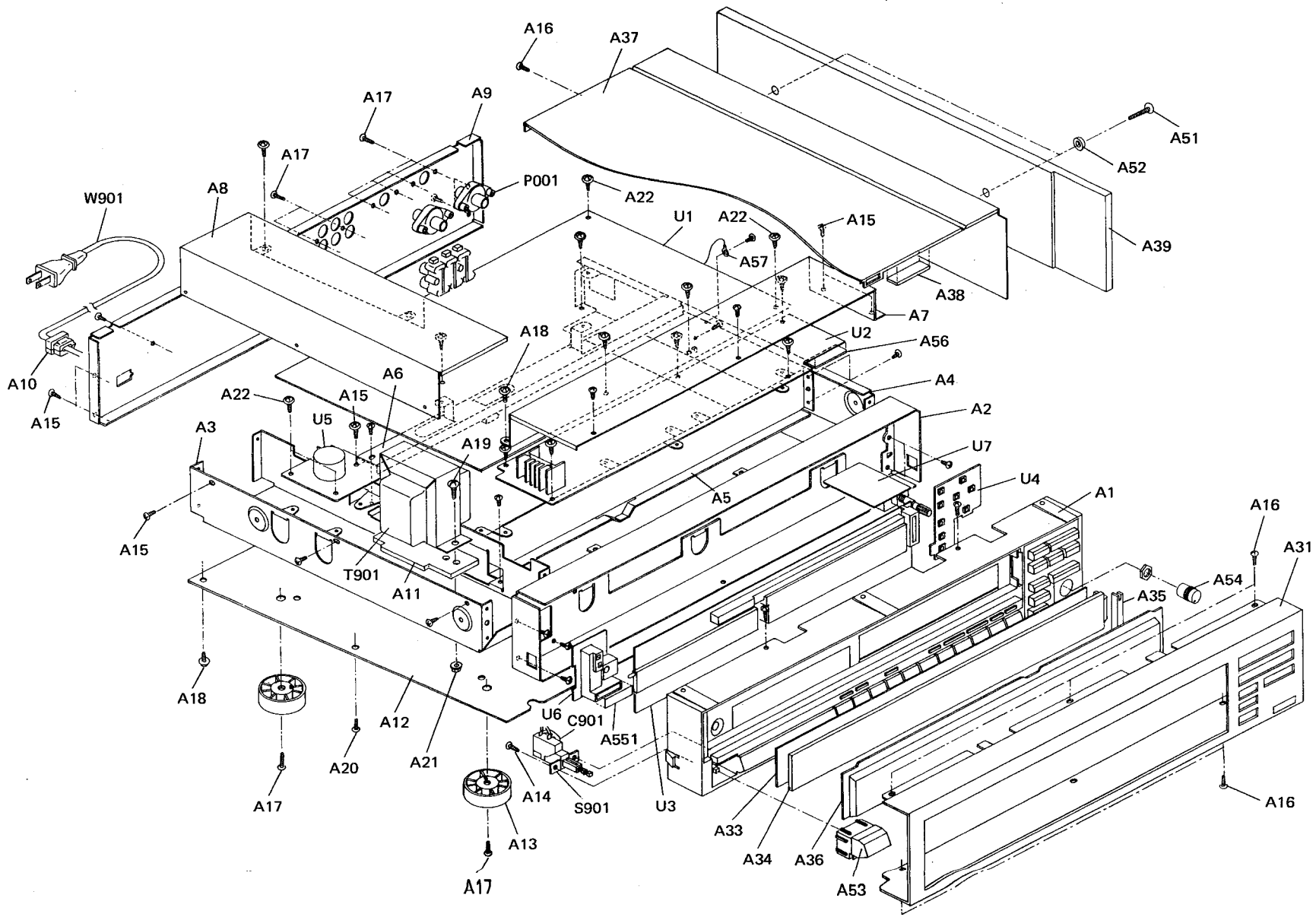
CAUTION

1) If you move the iron too quickly, loose soldering is likely to result.

2) Be especially careful when soldering the first lead where loose soldering is most liable to be formed.

(8) **Check the results**
When soldering of all leads is finished, check the soldered portion on every lead with a magnifying glass. A tester must not be used or checking of any soldered position

EXPLODED VIEW



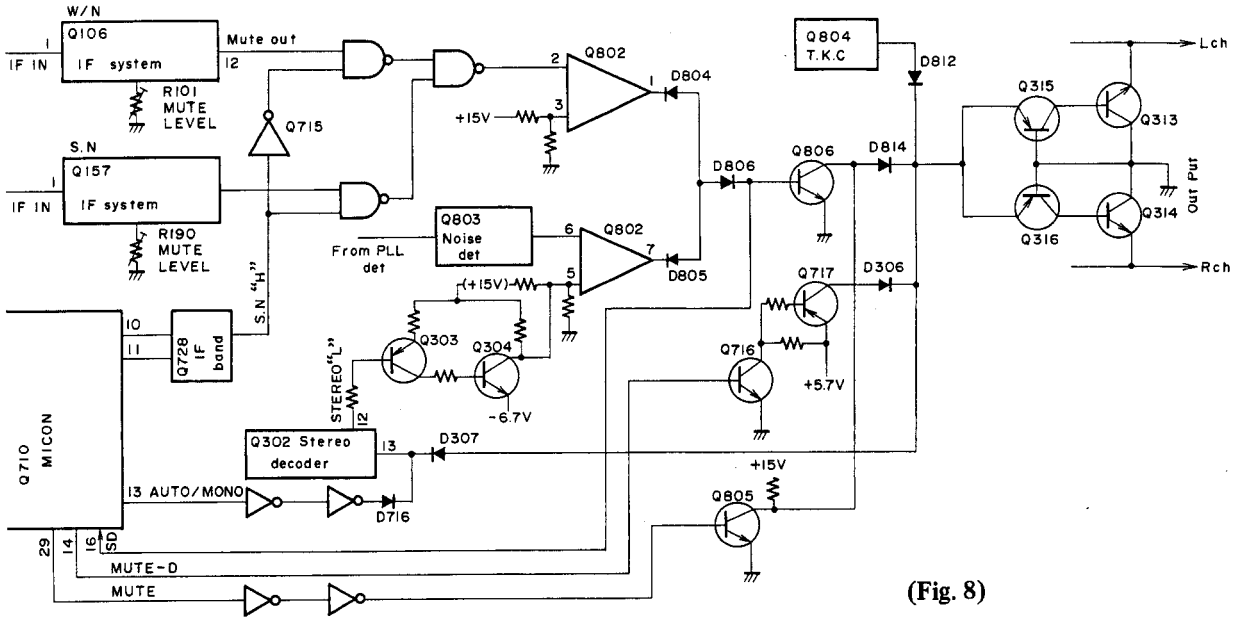
PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
A1	27110375A	Front bracket ass'y
A2	27110377A	Front bracket RE
A3	27115228A	Side bracket L
A4	27115229A	Side bracket R
A5	27130498	Bracket FR
A6	27130499	Bracket RE
A7	27225085A	Shield cover FR
A8	27225086-1	Shield cover PT
A9	27121044A	Back panel
A10	27300750	⚠ Strainrelief
A11	27270214A	Spacer
A12	27170242A	Bottom board
A13	27175152	Leg
A14	833430080	3TTP+8P(BC), Tapping screw
A15	834430068	3TTS+6B(BC), Tapping screw
A16	838430088	3TTS+8B(BC), Tapping screw
A17	834430108	3TTS+10B(BC), Tapping screw
A18	381430088	3TTW+8B(BC), Tapping screw
A19	838440129	4TTB+12C(BC), Tapping screw
A20	801230	3STS+8BQ(BC), Tapping screw
A21	86414010	FWN4 X 10FN, Flange nut
A22	831130088	3TTW+8B, Tapping screw
A31	1A070121	Front panel ass'y
	28135145	Badge
A33	28133188B	Back plate
A34	28130247A	Dial plate
A35	27267513	Guide, dial plate
A36	28191436	Clear plate
A37	28184318A	Top cover
A38	28140020	Cushion
A39	28185255	Side panel L
	28185256	Side panel R
A51	386440303	4STV+30CQ(BC), Special screw
A52	870086	Special washer
A53	28323145A	Knob POWER
A54	28323031-1	Knob TONE
A55	28199172	Film
A56	28175144	Insulated plate
A57	223004-1	Terminal
C901	3500065A	⚠ 0.01μF, AC400V/125V, Capacitor IS
C901a	27300601	⚠ SB-1925, Cover for C901
P001	25060112	NTM-1PDMR046, Antenna terminal
S901	25035571	⚠ NPS-111-L533P, Power switch
T901	2300261	⚠ NPT-973G, Power transformer
U1	1A069590-1A	NARF-3090-1a, Main circuit pc board ass'y
U2	1A069591-1	NADG-3091-1, Digital circuit pc board ass'y
U3	1A069592-1	NADIS-3092-1, Display circuit pc board ass'y
U4	1A069593-1	NASW-3093-1, Operation switch pc board ass'y
U5	1A069594-1A	NASW-3094-1a, Power supply circuit pc board ass'y
U6	1A069596-1	NAETC-3096-1, Remote control circuit pc board ass'y
U7	1A069597-1	NAETC-3097-1, Output volume pc board ass'y
W901	253127B or 253129A	⚠ AS-CEE, Power supply cord

NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBER SPECIFIED.

CIRCUIT DESCRIPTIONS

1. Muting circuit

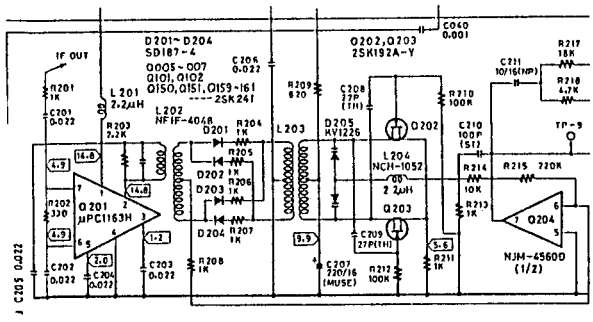


(Fig. 8)

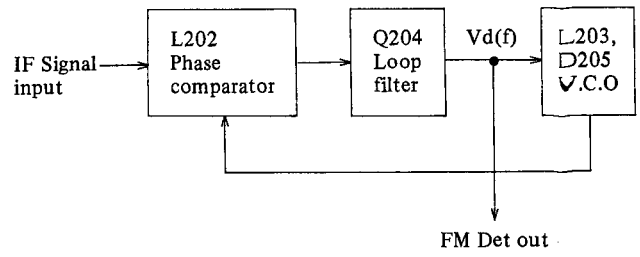
In Q106 and Q157 FM IF system IC, the muting IF level (determined by pin 15 semi-fixed resistor) detector circuit and zero cross detector circuit are built in. At the time of tuning, this output at pin 12 becomes 0V. The Q715 NAND gate is the selector gate circuit for SUPER NARROW and WIDE/NARROW muting.

At the time of AUTO TUNING if a broadcast station is picked up, pin 12 of Q106 goes to low level and Pin 2 of Q802 goes low. Also, at the same time, when noise is not included in the detected signal, pin 6 of Q802 goes low. Because of that, output pins 1 and 7 of Q802 have +12V, the anode side of D806 has +5V, pin 16 SD terminal of the Q710 microcomputer goes high, and the automatic tuning is completed. In addition, at the same time Q806 goes ON, Q313~Q316 are in cutoff state, and the signal is output. When the Q805 transistor muting switch is OFF (when the FM MUTE indicator is extinguished), the muting is forced to the open condition.

2. PLL detector circuit



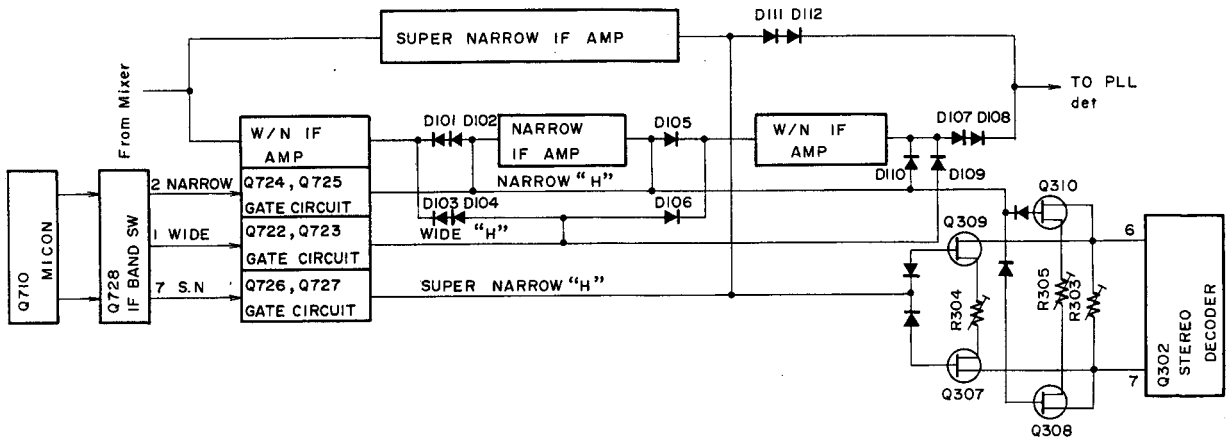
(Fig. 9)



(Fig. 10)

In this device, in order to have a high S/N and low percentage of distortion, a PLL (phase locked loop) detector is used. Because the PLL detector is a closed loop detector, noise generated within the loop is suppressed, and it is an extremely good S/N detector.
With L203 and D205 as a 10.7MHz voltage controlled oscillator, and with L202, and D201~D204 as a single phase comparator, the single phase error portion of the FM IF waveform and 10.7MHz voltage controlled oscillator signal are output at the center point of the secondary side of L202, passed through the loop filter, and the composite signal is then taken out. Also, when the 10.7MHz intermediate frequency is transferred, the amount of variation is compensated by the D205 variable capacitor diode, and the output error of the single phase comparator is always set to a zero level.

3. IF band selection circuit



(Fig. 11)

At the A/D input signal pin 63 of Q710, when the SD terminal goes low, automatically the IF band is determined. At the time of NARROW selection, the output of pin 10 goes H, and at the time of SUPER NARROW, pin 11 goes H. In Q728, at the band selection switch, pins 1, 2, and 7 respectively go high for WIDE, NARROW, and SUPER NARROW.

– Wide operation –

Q722 and Q723 go ON, the collector voltage of Q723 becomes essentially +B2, D103, D104, and D106 go ON, and the IF signal passes through D103, D104, and D106.

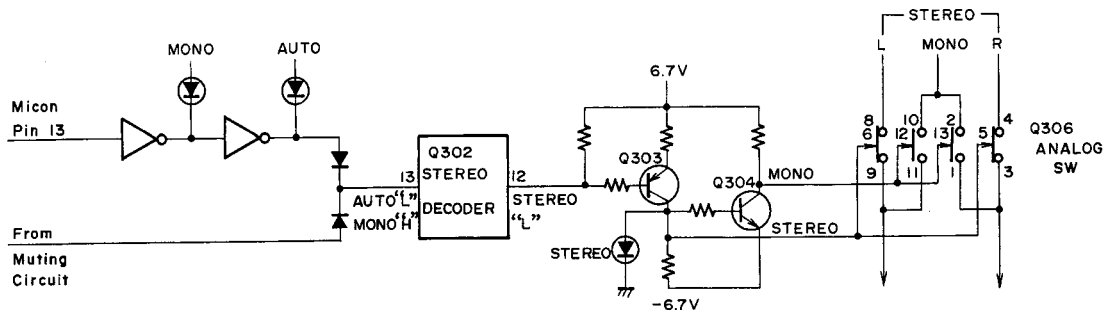
– Narrow operation –

Q724 and Q725 go ON, D102, D101, and D105 go ON, and the IF signal passes through NARROW amplifier Q104. Also, at the time of WIDE, in order to change to maximum operation, Q308 and Q310 are turned ON, and with R305, compensation of operation is carried out.

– Super Narrow operation –

Q726 and Q727 turn ON, D111 and D112 diodes go ON, and the signal passed through the super narrow IF amplifier is output in the PLL detector circuit. Also, for the alignment of narrow, Q307 and Q309 go ON, and separation is compensated by R304.

4. Stereo switch circuit



(Fig. 12)

When a stereo broadcast is received, pin 12 of Q302 goes "L", Q303 goes ON, the collector voltage becomes H, and the stereo indicator lights. Also, pins 5 ans 6 of the Q306 analog switch go H, conduction occurs between 3~4 pins and 8~9 pins, and at the Q302 stereo decoder, the L and R divided signal is output. In addition, at the time of monaural broadcast reception, and when the MODE switch is in the MONO position, pin 12 goes H, and because Q303 and Q304 are in the cutoff condition, pins 12 and 13 of Q306 go to high level, conduction takes place between pins 10~11 and 1~2, and the detected signal passes through the AF amplifier to be output.

5. Explanation of PLL synthesizer and controller IC

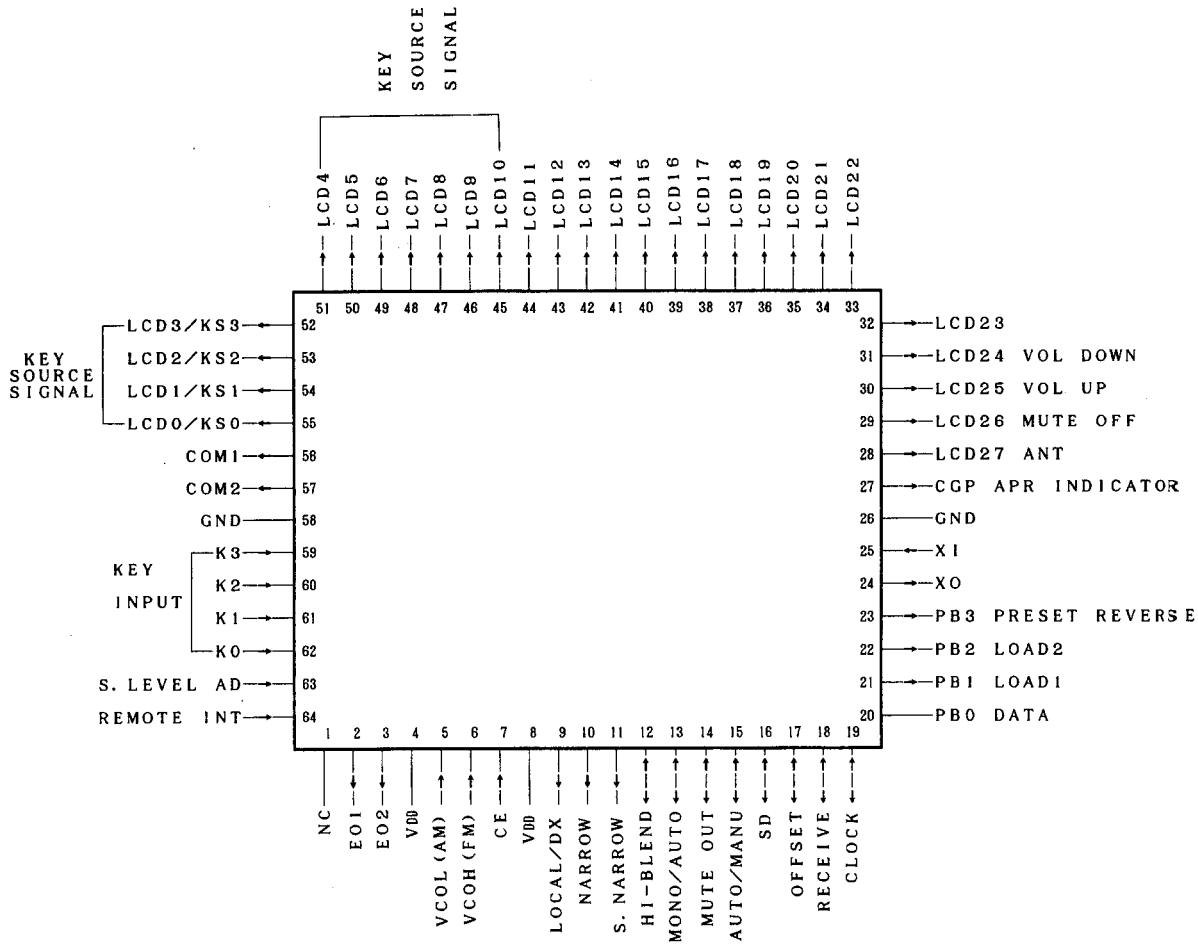
5-1. APR function (Automatic Precision Reception)

On the FM band, if there is a high level input at the SD terminal, depending upon the station signal level, there will be optimum reception function, and the output (Refer table 1) will automatically be changed.

ANT	RF	IF	AUTO/MONO	HI-BLEND
A	LOCAL	WIDE NARROW	AUTO	OFF
B	DX	SUPER NARROW	MONO	ON

Table 1 Changeover key means of APR execution.

5-2. Terminal connection



Pin No.	Symbol	Description
1	NC	No connection.
2	E01	Charge pump output of the phase detector which constitutes the PLL. High level is output when the divided oscillation frequency is higher than the reference frequency. In the opposite case, Low level is output. Floating occurs when the frequencies match. The output is applied to the variable capacitor diode in the local oscillation circuit of FM through the low pass filter Q701, Q702 and Q703. The output from both terminals is the same, but only E01 is used.
3	E02	Same as above.
4	VDD	This is the device power source terminal. At the time of operation, the supply is 5V. The internal data memory (RAM) is maintained by means of the C712 super capacitor.
5	VCOL (AM)	AM local oscillation signal input terminal. Not used.

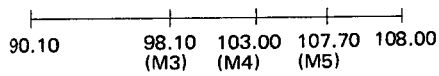
Pin No.	Symbol	Description
6	VCOL (FM)	At the FM local oscillation signal input terminal, there is direct input passage through the buffer.
7	CE	Chip enable input terminal. Device selection signal terminal. Normal operation at the high level and Memory preservation at the low level.
8	VDD	Device power source terminal.
9	LOCAL/DX	This is the output terminal for RF, either Local or DX. It is "H" for DX.
10	NARROW	This is the output terminal for IF, either Narrow or Wide. It is "H" for Narrow.
11	SUPER NARROW	This is the output terminal for IF, either Super Narrow or Wide. It is "H" for Super Narrow.
12	HI-BLEND	This terminal is for Hi-blend output ON or OFF. ON is "H".
13	MONO/AUTO	In the reception mode, the output terminal is either Auto or Mono. It is "H" for Mono.
14	MUTE OUT	The muting output terminal operates with the following modes. Power source ON, MANUAL/AUTO UP/DOWN, PRESET MEMORY call out, ANTENNA, RF, IF, AUTO/MONO, at time of MUTING selection, when the PROGRAM DISPLAY key is pushed, AUTO MEMORY time.
15	AUTO/MONO	This is the output terminal for Auto or Manual in the tuning mode. It is "H" for Auto.
16	SD	Station detection signal input terminal. "H" when active.
17	OFFSET	Offset output terminal when the signal input level is large. "H" when active.
18	RECEIVE	Indication output terminal when be received the code from remote control.
19	CLOCK	Clock signal output terminal to μPD6320GC.
20	DATA	Data signal output terminal to μPD6320GC.
21	LOAD1	Load signal output terminal to μPD6320GC.
22	LOAD2	Load signal output terminal to μPD6320GC.
23	PRESET	This is the output terminal for Shift indicator, either 1-10 or 11-20. 11-20 is "H".
24	XO	Connect to the 4.5MHz crystal osillator.
25	XI	
26	GND	Ground terminal.
27	APR	APR indication terminal.
28	ANT	This is the output terminal for ANT, either A or B. It is "H" for B.
29	LCD26/PL2	This is the out terminal for Muting of weak input, either ON or OFF. It is "H" for OFF.
30	VOL UP	Volume UP signal output terminal from remote control. Active high.
31	VOL DOWN	Volume DOWN signal output terminal from remote control. Active high.
32-44	LCD23-11	No connection.
45-55	LCD10/KS10 LCD0/KS0	These are the output terminals for key return signal source. "H" when active.
56, 57	COM1, COM2	Not used.
58	GND	Ground terminal.
59	K3	These are the input terminal for key return signal source and diode matrix.
60	K2	
61	K1	
62	K0	
63	SLEVEL	Station signal level input terminal.
64	REMOTE	System code input terminal from remote control. Active at the leading edge.

5-3. Explanation of momentary key

Input / Output		59	60	61	62
		K3	K2	K1	K0
55	LCD0		PRESET SCAN	AUTO MEMORY	AUTO/MENU
54	LCD1	HI-BLEND	AUTO/MONO	IF	RF
53	LCD2	ANT	SIGNAL DISPLAY	TUNING LEVEL	MEMORY
52	LCD3	M4/M14	M3/M13	M2/M12	M1/M11
51	LCD4	M8/M18	M7/M17	M6/M16	M5/M15
50	LCD5		PRESET REVERSE	M10/M20	M9/M19
49	LCD6	AM	FM	UP	DOWN
48	LCD7		PROGRAM DISPLAY	APR	PROGRAM
47	LCD8	REM10	DISPLAY	AM1	AM0
46	LCD9	PRESET16	FM ONLY	FM1	FM0
45	LCD10	SYSTEM	ANTA	ANTAPRD	ANTMEMO

AUTO/MANUAL
Selector key for AUTO TUNING/MANUAL TUNING Causes reversal of AUTO/MANU.
"H" when AUTO.

AUTO MEMORY
When the AUTO MEMORY key is pushed, "MEMORY" is displayed for 5 seconds, and during this, if the PRESET STATION key is pushed, AUTO SCANNING begins. The SD signal is above the tuning level preset from memory for that station.
At this time the APR data is also stored in memory. If the station key is pushed within 5 seconds, the memory display is cleared, and the condition for memory possibility is cancelled.
Example: A 90.10MHz signal is being received. The AUTO MEMORY key is pushed, and if within 5 seconds key M3 is pushed, continuous UP feed is carried out, and if a station is received, the M3 preset channel display is executed. If there is a 1 second stop, the UP operation starts again. In the manner shown below, the data is stored in memory for M4 and successive positions in sequence up to 108.00MHz, and when scanning is completed, at the final memory station call out, the automatic memory operation is completed.



At frequencies above 90.10MHz, when there are no broadcast stations, if the data of M2 is called out, the automatic memory operation stops. In the case of starting from M1, the lower limit frequency of 87.50MHz is called out and the operation stops.

PRESET SCAN
Every 5 seconds the preset memory data is received with a sawtooth mode in the up direction. At this time, the preset station display (FL tube and LED) blinks at 1Hz. If at that time there is preset reception, after the next preset, if there is no preset reception, scanning occurs from M1.

If, during the above operation, any key is pushed, the scan stops, and that key's operation is carried out. When the PRESET SCAN key is pushed, the operation is cancelled.

RF
With the RF selector key, the LOCAL/DX output can be reversed.
The level is "H" when in DX.

TUNING LEVEL – Tuning level selector key
When this key is pushed, after the display of about 1.5 seconds, the present tuning level (when RF=LOCAL, a value of 10dB) the display returns to the original value.

During the tuning level display, if the TUNING LEVEL key is pushed, the display will appear for about another 1.5 seconds. Also, during this display, the TUNING output goes "H". During this interval, when another key is pushed, the display returns, and that key's operation is carried out.

UP/DOWN – Receiving channel UP/DOWN key
(I) Manual tuning mode
Each time the UP(DOWN) key is pushed, the frequency is raised (lowred) one step.
Also, if the key is pushed continuously for more

than 0.5 second, up to the time the key is released, continuous stepping will be carried out at about 80msec/step (in the FM band with 25kHz step, at about 50msec/step).

(II) Auto tuning mode
When the UP(DOWN) key is pushed, continuous feeding is carried out. At that time, APR functions, and the conditions required for AUTO TUNING steps are carried out.
The scanning sped is about 100msec/step.

During scanning, if the same direction UP/DOWN key is pushed, the scanning continues, and when any other key is pushed, the scanning stops, and that key's operation is carried out.

PROGRAM – Program mode setting key
When the program mode is ON, at the time of power being turned ON, the preset memory (M1-M5) is called out in sequence. (After M5, the sequence is repeated starting again with M1.)

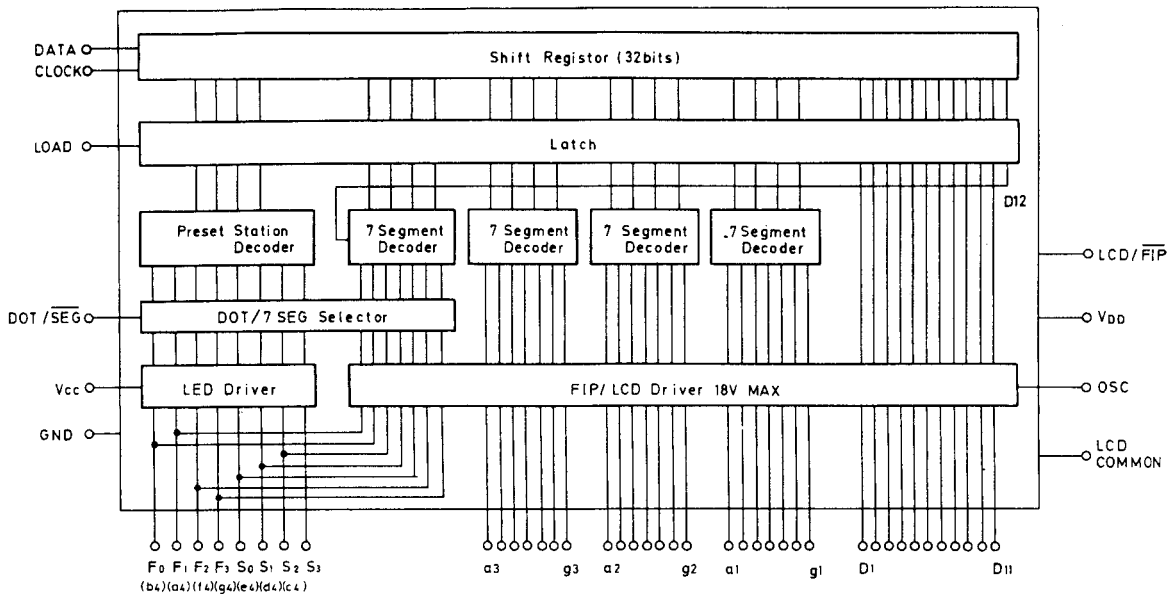
APR – APR execution key
Each time this key is pushed, the APR is executed one time.

PROGRAM DISPLAY
In the program mode, this key is used in order to confirm the next preset memory to be called out. Accordingly, this used only in the program mode.

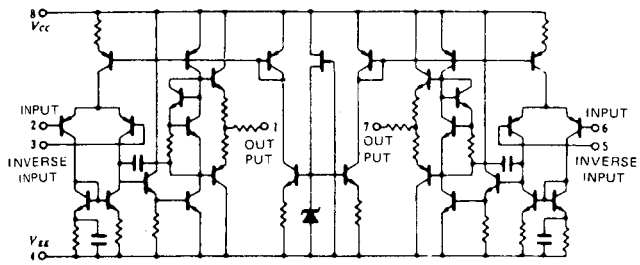
If this key is pushed while in the program mode, the preset memory to be called will be called when CE next goes from "L" to "H".

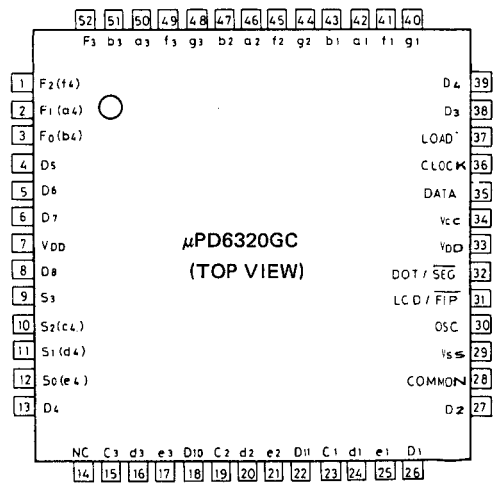
IC BLOCK DIAGRAM

μPD6320GC (Indicator drive)

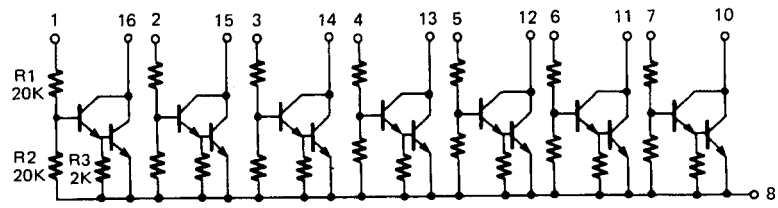


NJM4560D (Operation amplifier)

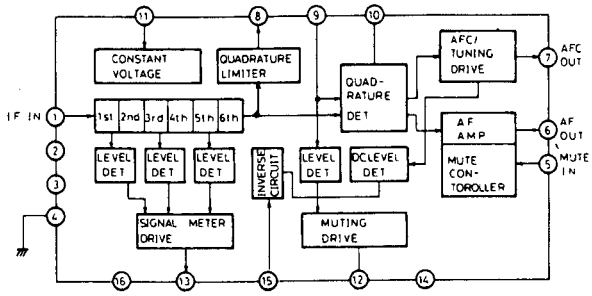




μPA81C (Buffer/Inverter)

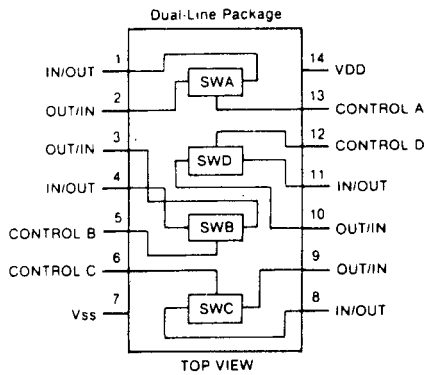


LA1235 (FM IF system)

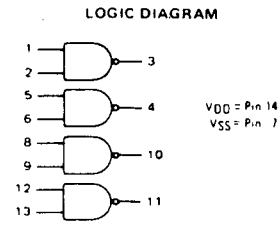


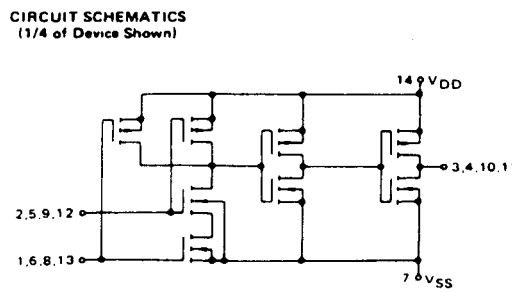
1. IF signal input
2. IF amplifier switch input
   H level: Off
5. Muting switch input
6. Composite signal output
7. AFC output
8. IF amplifier output
9. 10.7MHz input
10. Reference voltage
11. Power supply
12. Muting output
    Tuned: L level
13. Signal strength output
15. Muting level

4066B (Analog switch)

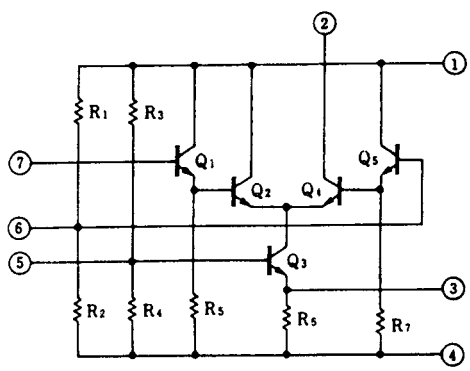


4011B (NAND gate)





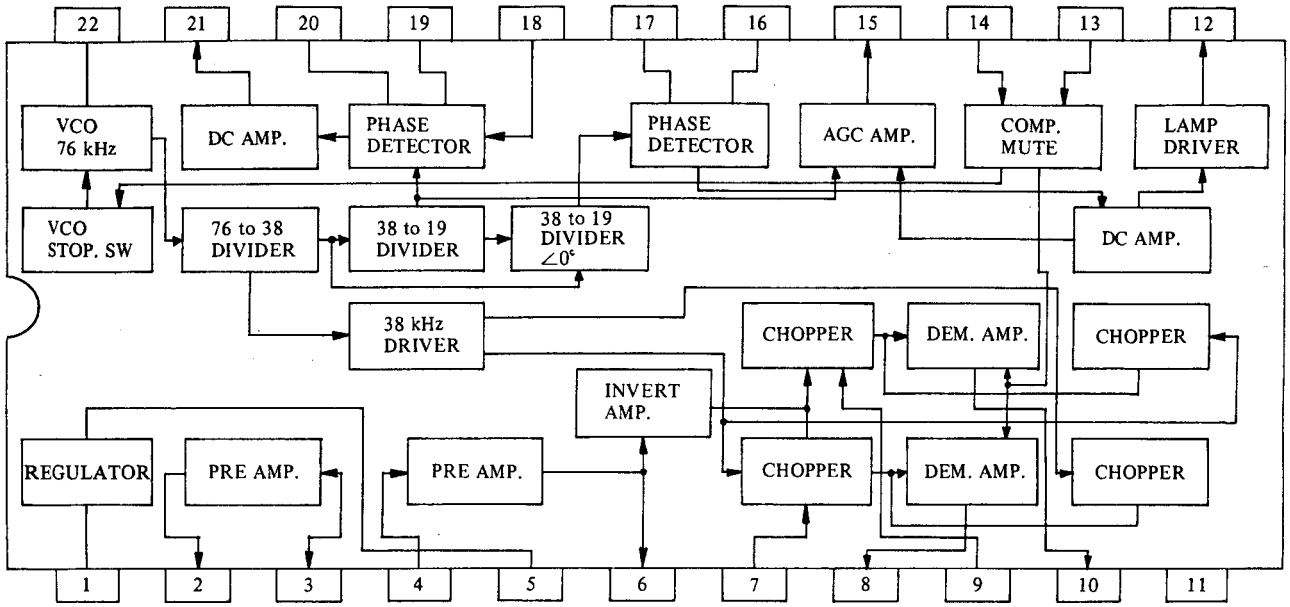
μPC1163H (RF amplifier)



Terminal No.	Operation
1	Vcc
2	OUTPUT
3	BYPASS
4	GND
5	BYPASS
6	INPUT BIAS
7	INPUT

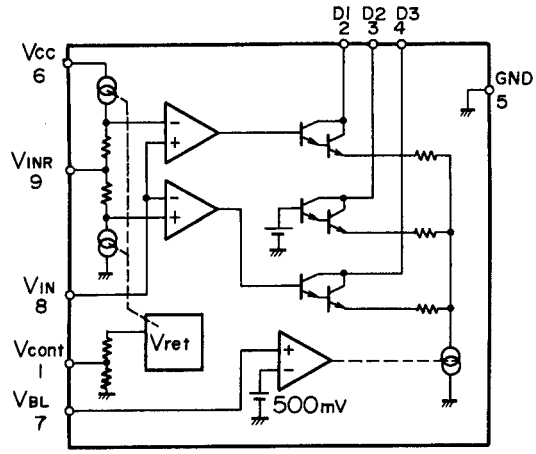
μPC1223C (Stereo decoder)

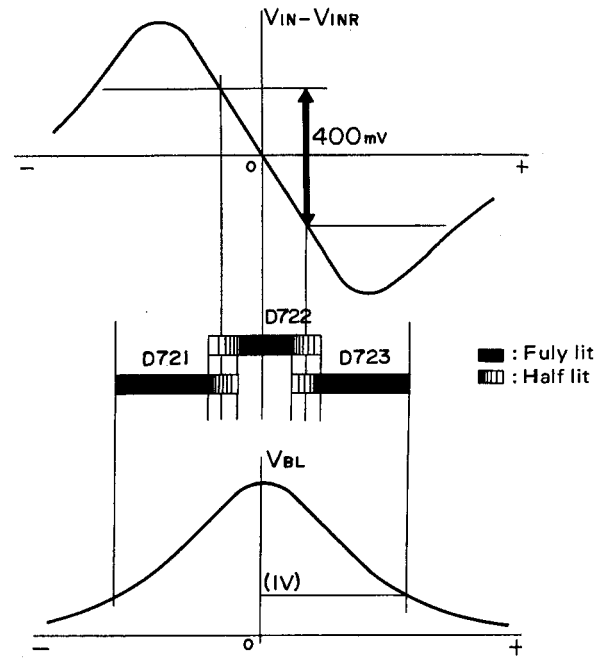
Block diagram



Terminal No.	Connection	Terminal No.	Connection
1	Vcc	12	ST. LAMP INDICATOR
2	PRE AMP. OUTPUT 1	13	ST–MONO SW & VCO STOP
3	PRE AMP. INPUT 1	14	MUTING SWS
4	PRE AMP. INPUT 2	15	19kHz CANCEL
5	BYPASS	16	LPF
6	PRE AMP. OUTPUT 2	17	LPF
7	POST AMP. INPUT	18	FILTER INPUT
8	L–ch OUTPUT	19	LPF
9	POST AMP. INPUT	20	LPF
10	R–ch OUTPUT	21	LPF
11	GND	22	OSC RC NETWORK

LB1450 (Tuning indicator drive)

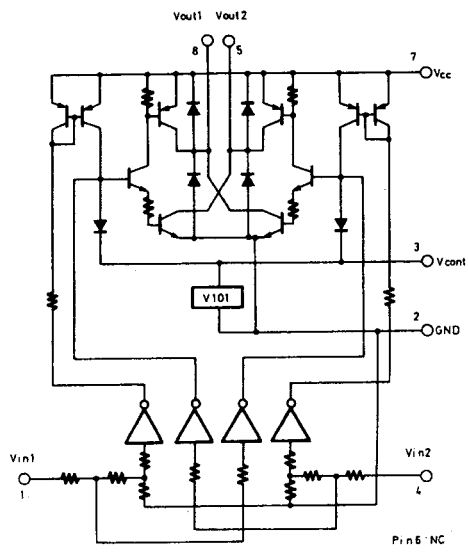




(Fig. 14)

As shown in the figure 14, the difference between the AFC output terminal pin 7 of the Q157 FM IF system IC and standard voltage terminal pin 10 becomes an S-curve characteristic. Using this characteristic, the TUNING indicator is caused to light.

LB1630 (Motor drive)



Truth Table

Vin 1	Vin 2	Vout 1	Vout 2	Motor
H	L	H	L	Clockwise
L	H	L	H	Counter-clockwise
H	H	OFF	OFF	Stop
L	L	OFF	OFF	Stop

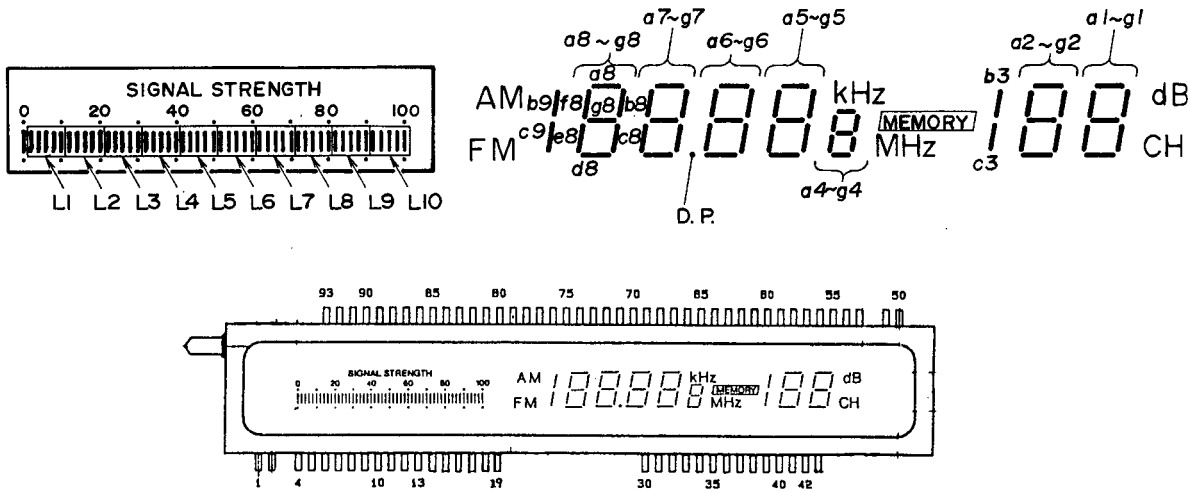
LA7910 (Band switch)

Truth Table

Input		Output			
Pin 3	Pin 4	Pin 1	Pin 2	Pin 7	Pin 8
L	L	H	Z	Z	Z
H	L	Z	H	Z	Z
L	H	Z	Z	H	Z
H	H	Z	Z	Z	H

1. Output terminal
2. Output terminal
3. Input terminal
4. Input terminal
5. Ground terminal
6. Vcc2
7. Output terminal
8. Output terminal
9. Vcc1

FIP12AMW7S (Fluorescent indicator tube)



Terminal connection

(Lower)

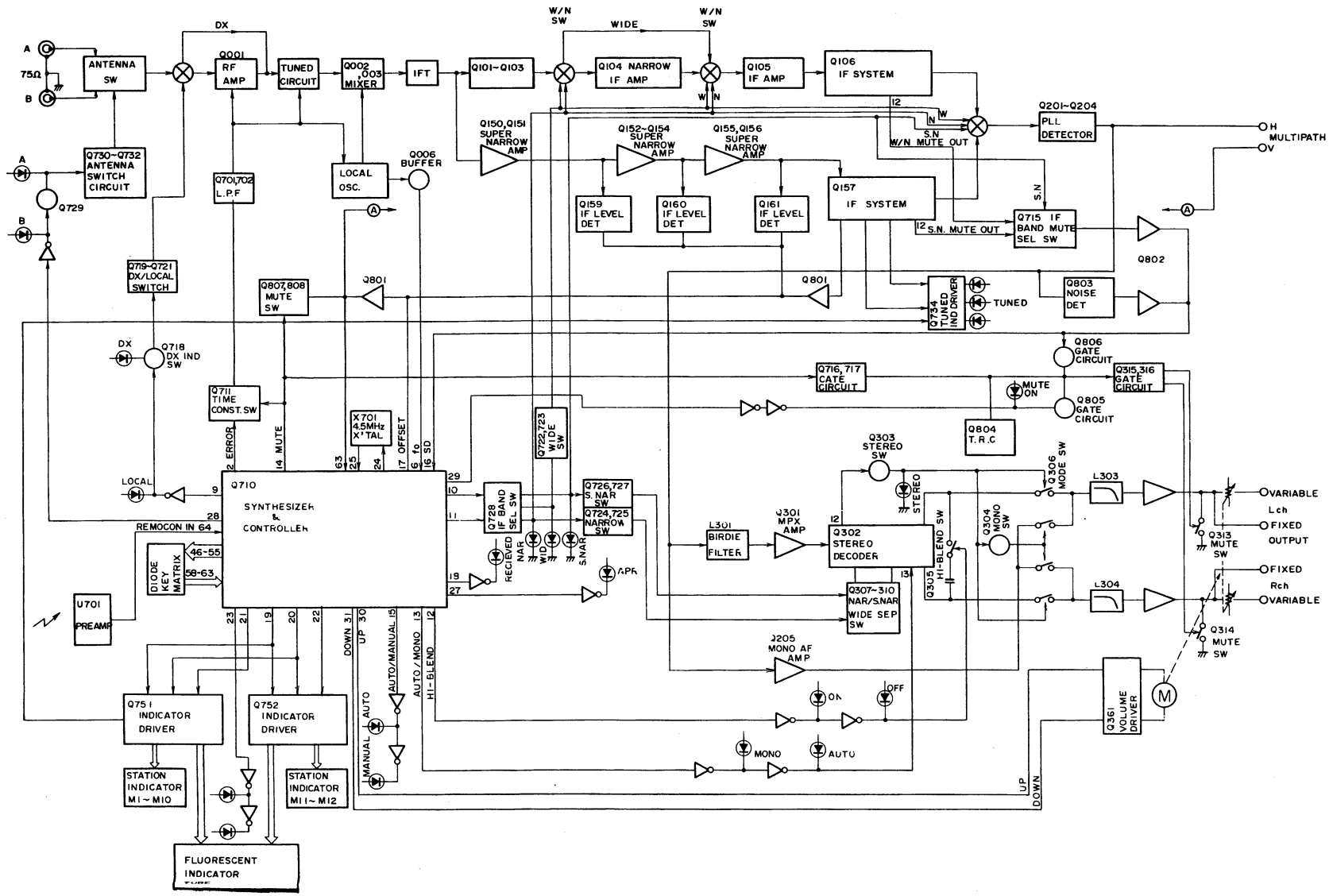
Terminal No.	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Electrode	F	F	G	dB	CH	*Z	*FM	b9 c9	e8	d8	c8	G	e7	d7	c7	c6
Terminal No.	18	19	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Electrode	d6	e6	e5	d5	c5	g4	a4 c4 d4 f4	b4 e4	b3 c3	G	e2	d2	c2	e1	d1	c1

(Upper)

Terminal No.	50	51	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Electrode	F	F	G	b1	a1	f1	g1	b2	a2	f2	g2	G	b5	a5	f5	g5
Terminal No.	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
Electrode	b6	a6	f6	G	g6	b7	a7	f7	g7	b8	a8	G	f8	g8	*AM	a11
Terminal No.	83	84	85	86	87	88	89	90	91	92	93					
Electrode	L10	L9	L8	G	L7	L6	L5	L4	L3	L2	L1					

F: Filament G: Grid Z: MEMORY FM: FM, D. P., MHz AM: AM, kHz

BLOCK DIAGRAM



ADJUSTMENT PROCEDURES

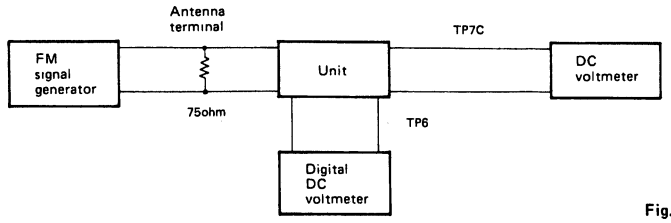


Fig. 1

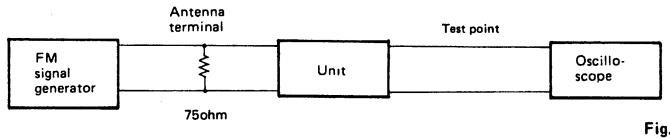


Fig. 2

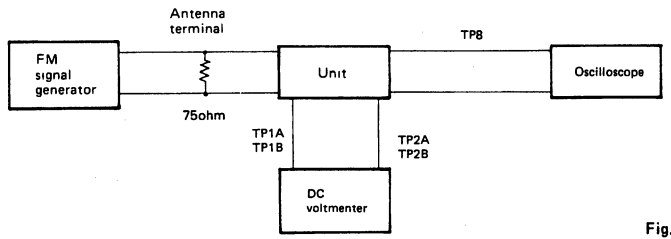


Fig. 3

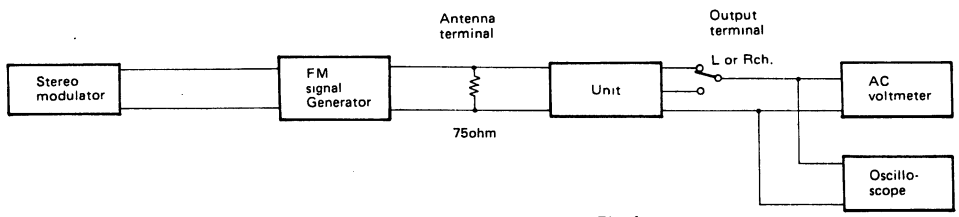
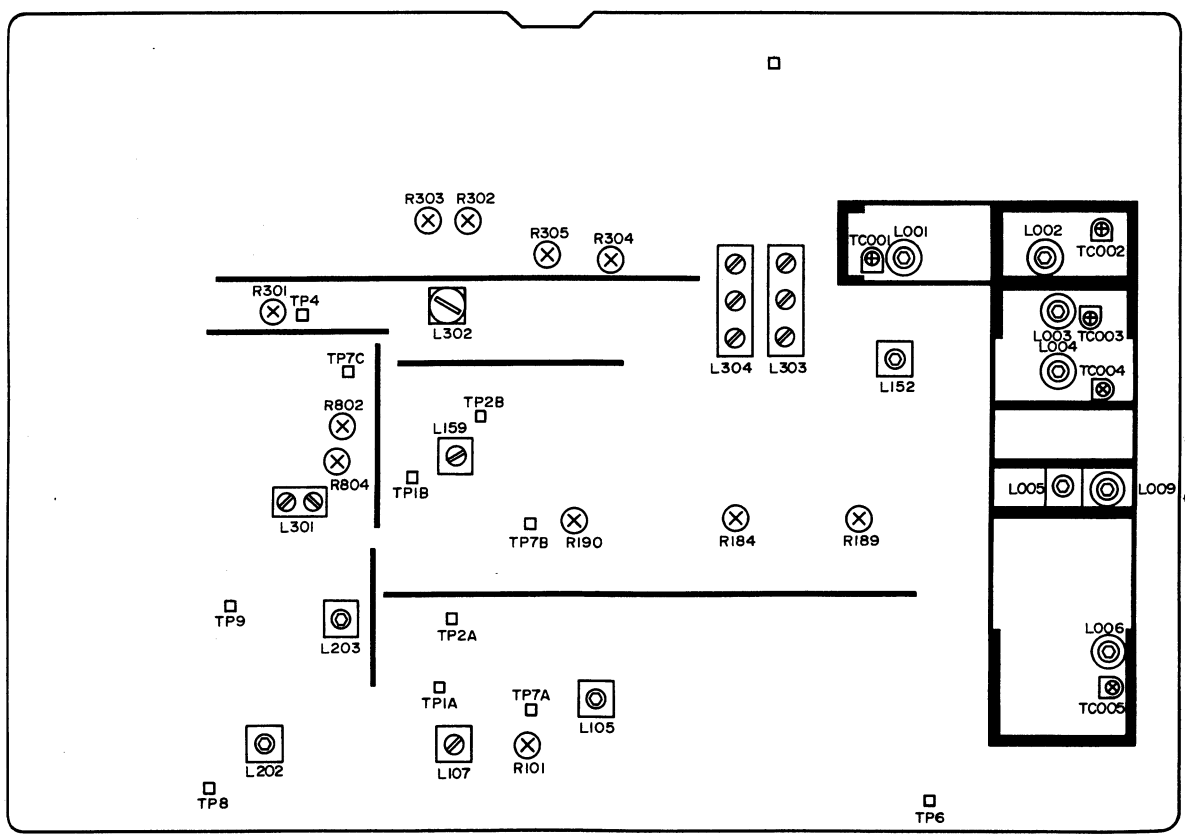
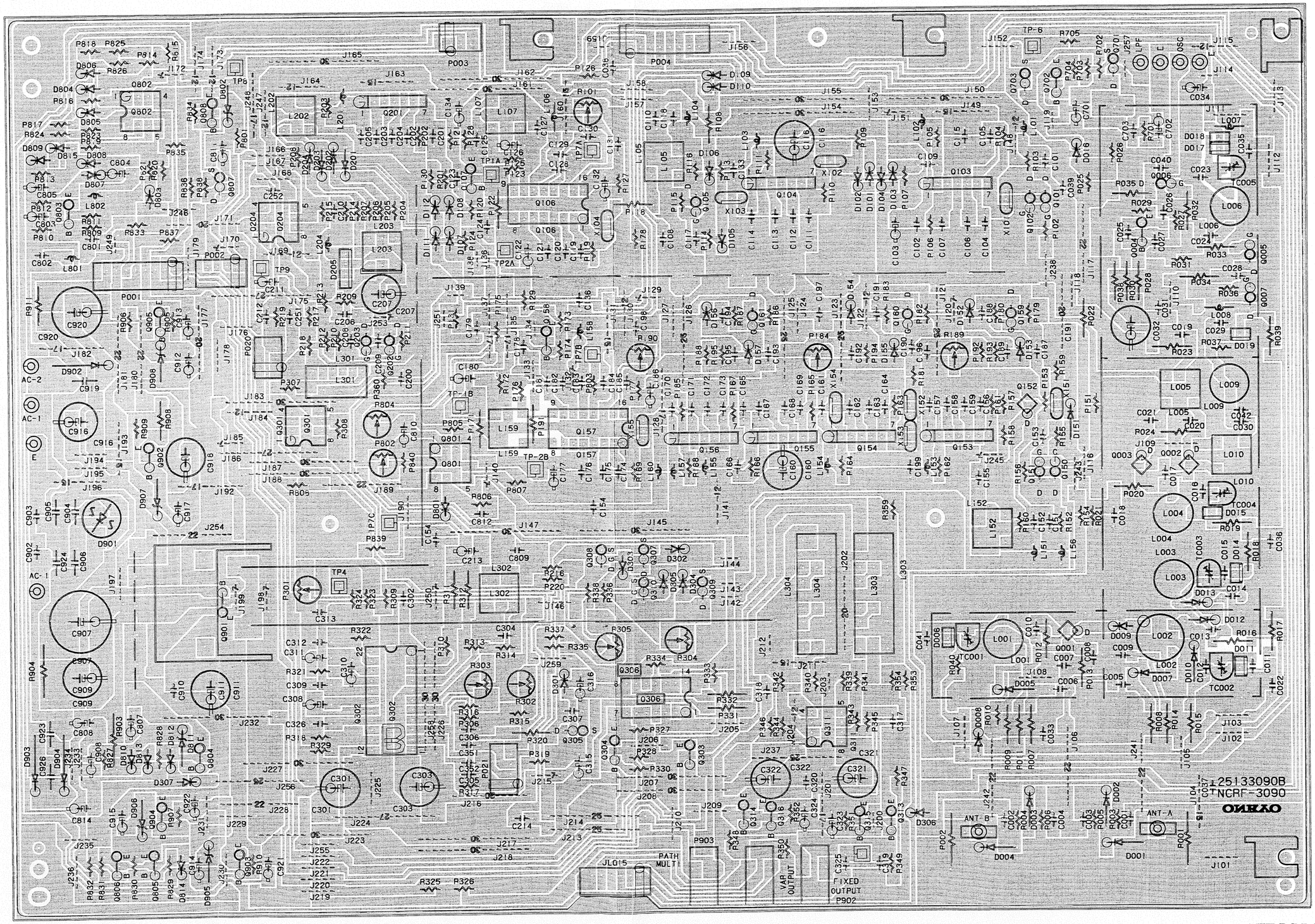


Fig. 4



Item	Step	Connection of instrument	FM SG output	Stereo modulator output	Tuned frequency	Output indicator	Adjustment point	Adjust for	Remarks
Front End adjustment	1	Fig. 1		————	108.000MHz	Digital DC voltmeter	TC005	24.0 ± 0.2V	Repeat the steps 1 and 2 until no further adjustment is necessary. IF Band: Super Narrow
	2			————	87.500MHz		L006	4.0 ± 0.1V	
	3		108MHz 1kHz, 75kHz devi. 10dB/ μV (15.2dBf)	————	108.000MHz	DC voltmeter	TC001, TC002, TC003, TC004	Maximum	Repeat the steps 3 and 4 until no further adjustment is necessary. IF Band: Super Narrow
	4		87.5MHz 1kHz, 75kHz devi. 10dB/ μV (15.2dBf)	————	87.500MHz		L001, L002, L003, L004	Maximum	
	5						L005, L009	Maximum	
IF adjustment of wide & narrow		Fig. 2 TP7A	99MHz 1kHz, 75kHz devi. 10dB/ μV (15.2dBf)	————	99.000MHz	Oscilloscope DC: 500mV	L105	Maximum	IF Band: Wide
IF level adjustment of super narrow		Fig. 2 TP7C	99MHz 1kHz, 75kHz devi. 10dB/ μV (15.2dBf)	————	99.000MHz	Oscilloscope DC: 500mV	L152	Maximum	IF Band: Super Narrow
Muting adjustment of wide and narrow	1	Fig. 3 TP1A, 2A	99MHz 1kHz, 75kHz devi. 80dB/ μV (65dBf)	————	99.000MHz	DC voltmeter	L107	0V	IF Band: Wide
	2		99MHz 12dB/ μV (17.5dBf)		99.000MHz	Oscilloscope	R101	Variable point.	
Muting adjustment of super narrow	1	Fig. 3 TP1B, 2B	99MHz 1kHz, 75kHz devi. 60dB/ μV (65dBf)		99.000MHz	DC voltmeter	L159	0V	IF Band: Super Narrow
	2		99MHz 12dB/ μV (17.5dBf)		99.000MHz	Oscilloscope	R190	Variable point.	
PLL detector adjustment		Fig. 2 TP-9	99MHz 1kHz, 75kHz devi. 80dB/ μV (85dBf)		99.000MHz	DC voltmeter (TP–9)	L203	0±0.1V	IF band:Wide RF:DX
VCO		Connect the frequency counter to TP4	99MHz 1kHz, 75kHz devi. 80dB/ μV (85dBf)		99.000MHz	Frequency counter	R301	76kHz ± 76Hz	Use the high Impedance probe (10:1).
Separation	1	Fig. 4	99MHz Ext. modulation 80dB/ μV (85dBf)	L channel	99.000MHz	AC voltmeter or Oscilloscope	R303	Output of right channel becomes minimum	IF band: Wide.
				R channel			R302	Output of left channel becomes minimum	
	2		99MHz Ext. modulation 80dB/ μV (85dBf)	L channel	99.000MHz	AC voltmeter or oscilloscope	R305	Separation of L and R are same and maximum.	IF band:Narrow
				R channel					
	3		99MHz Ext. modulation 80dB/ μV (85dBf)	L channel	99.000MHz	AC voltmeter or oscilloscope	R304	Separation of L and R are same and maximum.	IF band:Super narrow
				R channel					
Signal indicator level adjustment	1		99MHz, 0dB/μV		99.000MHz	SIGNAL indicator	R804	5 (dBf)	Before adjustment, turn the semi-fixed resistors R802 and R804 fully clockwise. Proceed to adjustment during press the signal button.
	2		99MHz, 40dB/μV				R802	45 (dBf)	
	3		80dB/μV				R184	85 (dBf)	
	4		100dB/μV				R189	105 (dBf)	

PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE



MAIN CIRCUIT PC BOARD

PRINTED CIRCUIT BOARD-PARTS LIST

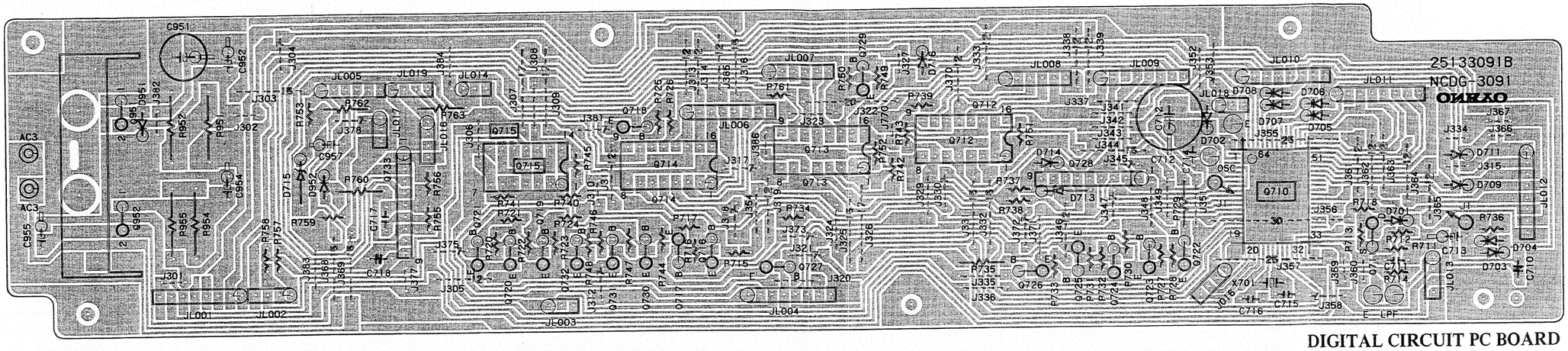
MAIN CIRCUIT PC BOARD (NARF-3090-1A)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICS	
Q103, Q104	222474	μPC1163H, RF amp
Q106, Q157	222680	LA1235, IF system
Q153-Q156	222474	μPC1163H, RF amp
Q201	222474	μPC1163H, RF amp
Q204, Q301	222579	NJM4560D, Op amp
Q302	222732	μPC1223C, Stereo decoder
Q306	222840661	4066B, Analog switch
Q311	222579	NJM4560D, Op amp
Q801, Q802	222579	NJM4560D, Op amp
Q901	222780151NEC	78M15, Regulator
	TRANSISTORS	
Q001-Q003	2212514	3SK114-Y
Q004	2211723	2SC1923-0
Q005-Q007	2212195	2SK241-GR
Q101, Q102	2212195	2SK241-GR
Q105	2212274	2SK192A-Y
Q107	2211723	2SC1923-0
Q150, Q151	2212195	2SK241-GR
Q152	2212514	3SK114-Y
Q158, Q304	2211255 or	2SC1815-GR or
	2210746	2SC945A-P
Q159-Q161	2212195 or	2SK241-GR or
	2212194	2SK241-Y
Q202, Q203	2212274	2SK192A-Y
Q303	2211455 or	2SA1015-GR
	2210803	2SA733-P
Q305	2211945	2SK246-GR
Q307-Q310	2211945	2SK246-GR
Q313, Q314	2211704 or	2SD655-D or
	2211705	2SD655-E
Q315, Q316	2211454	2SA1015-Y
Q701	2212294	2SK108-D
Q702	2211255	2SC1815-GR
Q703	2211945	2SK246-GR
Q803	2211255	2SC1815-GR
Q804	2211256	2SC1815-BL
Q805, Q806	2211255	2SC1815-GR
Q807	2211945	2SK246-GR
Q808	2211255 or	2SC1815-GR or
	2210746	2SC945A-P
Q902	2200792 or	2SB649-B or
	2200793	2SB649-C
Q903	2211256	2SC1815-BL
Q904	2211455 or	2SA1015-GR or
	2210803	2SA733-P
Q905	2211255	2SC1815-GR
	DIODES	
D001-D005	223165	BA282
D006	223154	1SV103
D007	223165	BA282
D008	223163	1SS133
D009, D010	223165	BA282
D011	223154	1SV103
D012, D013	223149	1SS85
D014, D015	223154	1SV103
D016	223163	1SS133
D017-D019	223154	1SV103
D101-D112	223163	1SS133
D151	223165 or	BA282 or
	223149	1SS85
D152-D157	223163	1SS133
D201-D204	223170	SD187-4
D205	223136	KV1226

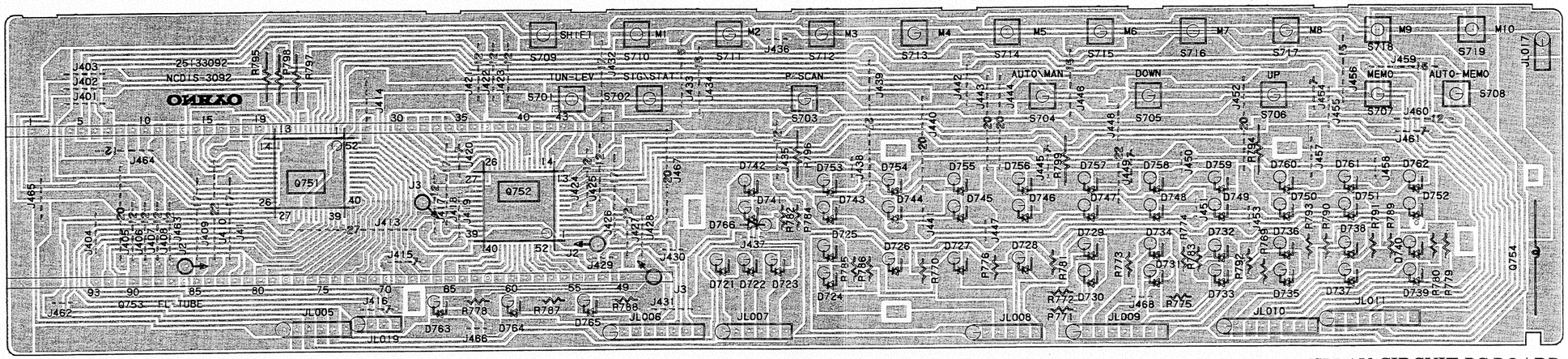
CIRCUIT NO.	PARTS NO.	DESCRIPTION
D301-D307	223163	1SS133
D801	223163	1SS133
D802	2239452 or	RD5. 1EB2 or
	224650512	HZ5. 1EB2
D803-D810	223163	1SS133
D811	2239492 or	RD6. 2EB2 or
	224650622	HZ6.2EB2
D812-D815	223163	1SS133
D901	223862 or	WL01 or
	223890	W01RL
D902-D904	223880 or	GP101N4003 or
	223848	GP08B
D905, D906	2239532 or	RD7. 5EB2 or
	224650752	HZ7. 5EB2
D907	2239672 or	RD15EB2 or
	224651502	HZ15EB2
D908	2239812 or	RD30EB2 or
	224653002	HZ30EB2
	COILS	
L001	233321	NFA-3053
L002	233322	NFRF-3038
L003	233324	NFRF-3040
L004	233323	NFRF-3039
L006	233325	NFO-3033
L007, L008	233359	NCH-2163
L009	233326	NFRF-3041
L010	233212	NFRF-4021
L101-L104	233359	NCH-2163
L105	233318	NFIF-4053
L106	233359	NCH-2163
L107	233378	NFIF-4063
L151	233359	NCH-2163
L152	233318	NFIF-4053
L153-L158	233359	NCH-2163
L159	233378	NFIF-4063
L160	233365	NCH-2169
L201	233359	NCH-2163
L202	233296	NFIF-4048
L203	233297	NFIF-4049
L204	233365	NCH-2169
L301	233379	NMC-5066
L302	233303	NMC-5042
L303, L304	233380	NMC-5067
L801	233122	NCH-3013
L802	231081	NCH-2129
	TRANSFORMER	
L005	233317	NFIF-4052
	CERAMIC FILTERS	
X101, X104	3010085	SFE-10.7MXK-A
X102	3010131	SFE-10.7MX2K-A
X103	3010086	SFE-10.7MS3G-A
X151-X154	3010130	SFE-10.7MZ2K-A
X155	3010132	SFE-10.7MJK-A

CIRCUIT NO.	PART NO.	DESCRIPTION
	CAPACITORS	
C032	391242217	220 μF, 16V, Elect.
C034	354780109	1 μF, 50V, Elect.
C038	379121034	0.01μF ±5%, 50V, Plastic
TC001-TC004	3060020	NTC-2P17, Trimmer
TC005	3060017	NTC-10P15, Trimmer
C103	354741019	100μF, 16V, Elect.
C116	391242217	220μF, 16V, Elect.
C122	354780229	2.2μF, 50V, Elect.
C126	354742219	220μF, 16V, Elect.
C132	354780109	1μF, 50V, Elect.
C134	354741019	100μF, 16V, Elect.
C136, C137	379122225	2, 200 ±10%, 50V, Plastic
C160	391242217	220μF, 16V, Elect.
C177	354780229	2.2μF, 50V, Elect.
C180	354741019	100μF, 16V, Elect.
C186	354780109	1μF, 50V, Elect.
C207	391242217	220μF, 16V, Elect.
C210	372121014	100pF ±5%, 50V, Styrene
C211	352941006	10μF, 16V, Non-polar Elect.
C212	379121524	1,500pF ±5%, 50V, Plastic
C213	391241017	100μF, 16V, Elect.
C301	391244717	470μF, 16V, Elect.
C302	379124734	0.047μF ±5%, 50V, Plastic
C303	391244717	470μF, 16V, Elect.
C304	379124724	4,700pF ±5%, 50V, Plastic
C305, C306	379121524	1,500pF ±5%, 50V, Plastic
C307	379123334	0.033μF ±5%, 50V, Plastic
C308	354741009	10μF, 16V, Elect.
C309	370138214	820pF ±5%, 100V, APS
C310	354784799	0.47μF, 50V, Elect.
C311	354750479	4.7μF, 25V, Elect.
C312	379122724	2,700pF ±5%, 50V, Plastic
C313	370133914	390pF ±5%, 100V, APS
C315, C316	391242207	22μF, 16V, Elect.
C317, C318	352942206	22μF, 16V, Non-polar elect.
C319, C320	379121224	1,200pF ±5%, 50V, Plastic
C321, C322	391244717	470μF, 16V, Elect.
C323, C324	354784799	0.47μF, 50V, Elect.
C701	391281017	100μF, 50V, Elect.
C702	395160227	2.2μF, 35V, Tantal
C703	379121034	0.01μF ±5%, 50V, Plastic
C803-C805	354784799	0.47μF, 50V, Elect.
C807	354742209	22μF, 16V, Elect.
C808	354754719	470μF, 25V, Elect.
C810	354781099	0.1μF, 50V, Elect.
C811	354742209	22μF, 16V, Elect.
C814	354754719	470μF, 25V, Elect.
C902, C903	379122234	0.022μF ±5%, 50V, Plastic
C904-C906	335251039	0.01μF, 500V, Ceramic
C907	354762229	2,200μF, 35V, Elect.
C908	354761009	10μF, 35V, Elect.
C909	354753319	330μF, 25V, Elect.
C910	379121034	0.01μF ±5%, 50V, Plastic
C911	391242217	220μF, 16V, Elect.
C912	354761019	100μF, 35V, Elect.
C913	354761009	10μF, 35V, Elect.
C914, C915	35474101	100μF, 16V, Elect.
C916	354764719	470μF, 35V, Elect.
C917	354741019	100μF, 16V, Elect.
C918	391242217	220μF, 16V, Elect.
C920	354784719	470μF, 50V, Elect.
C921, C922	354741009	10μF, 16V, Elect.
C923, C924	335251039	0.01μF, 500V, Ceramic
	RESISTORS	
R101	5210064	N06HR10KBD, Semi-fixed
R184	5210066	N06HR22KBD, Semi-fixed
R189, R190	5210064	N06HR10KBD, Semi-fixed
R301	5210064	N06HR10KBD, Semi-fixed
R302, R303	5210074	N06HR470KBD, Semi-fixed
R304, R305	5210072	N06HR220KBD, Semi-fixed
R802	5210066	N06HR22KBD, Semi-fixed
R804	5210072	N06HR220KBD, Semi-fixed
R903	441626814	680ohm, 1W, Metal oxide film
R904	441720624	6.2ohm, 2W, Metal oxide film
R908	442521014	100ohm, 1/2W, Metal oxide film
R911	442520104	1ohm, 1/2W, Metal oxide film
	THERMISTORS	
R158	4000102	TD5-C410D
R192, R841	4000099	TD5-C230D
	TERMINALS	
P902	25045202	NPJ-4PDBL83, Output
P903	25045182	NPJ-2PDBL72, Multipath
	SOCKETS	
P001, P004	25050272	NSCT-8P100
P002	25050268	NSCT-4P96
P003	25050267	NSCT-3P95
JL015	25050270	NSCT-6P98
	CABLES	
	2010102	Antenna
	RADIATOR	
	27160221	RAD-74
	SHIELD CASE	
	27301031A	Tuned/Local osc circuit
	27301032A	Center
	27301033A	RF circuit
	BUSSES	
	27160213	Large
	27160214	Middle
	27160215	Small

PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE



DIGITAL CIRCUIT PC BOARD



DISPLAY CIRCUIT PC BOARD

PRINTED CIRCUIT BOARD-PARTS LIST

DIGITAL CIRCUIT PC BOARD (NADG-3091-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICS	
Q710	22240106	μPD1719G-520-12, Micon
Q712-Q714	222807	μPA81C, Buffer
Q715	222840111	4011B, NAND gate
Q728	222992	LA7910, Band switch
Q733	22240107	LB1450, Tuning indicator drive
Q951	222780052	78M05, Regulator
Q952	222780055	78M05HF, Regulator
	TRANSISTORS	
Q711	2211945	2SK246-GR
Q716, Q718	2211255 or	2SC1815-GR or
Q720, Q722	2210746	2SC945A-P
Q724, Q726	2211255 or	2SC1815-GR or
Q729, Q731	2210746	2SC945A-P
Q717, Q719	2211455 or	2SA1015-GR or
Q721, Q723	2210803	2SA733-P
Q725, Q727	2211455 or	2SA1015-GR or
Q730, Q732	2210803	2SA733-P

CIRCUIT NO.	PART NO.	DESCRIPTION
	DIODES	
D701-D709	223163	1SS133
D711, D714	223163	1SS133
D713	2239632 or	RD12EB2 or
	224651202	HZ12EB2
D715	2241291	RD3.3EB1
D716, D717	223163	1SS133
D951	223163	1SS133
	X'TAL	
X701	3010091	XTL-4.5M
	CAPACITORS	
C710	352921016	100μF, 6.3V, Non-polar elect.
C711	371121225	1,200pF ±10%, 50V, Mylar
C712	3020027,	0.047F, 5V
	3000051 or	0.047F, 5.5V or
	3000050	0.047F, 5.5V, Super
C713	354784799	0.47μF, 50V, Elect.
C718	354741009	10μF, 16V, Elect.

CIRCUIT NO.	PART NO.	DESCRIPTION
C951	354764719	470μF, 35V, Elect.
C952, C955	354741009	10μF, 16V, Elect.
C954	354781009	10μF, 50V, Elect.
	RESISTORS	
R951, R952	441622204	22ohm, 1W, Metal oxide film
R954, R955		
	RADIATOR	
	27160209	RAD-67

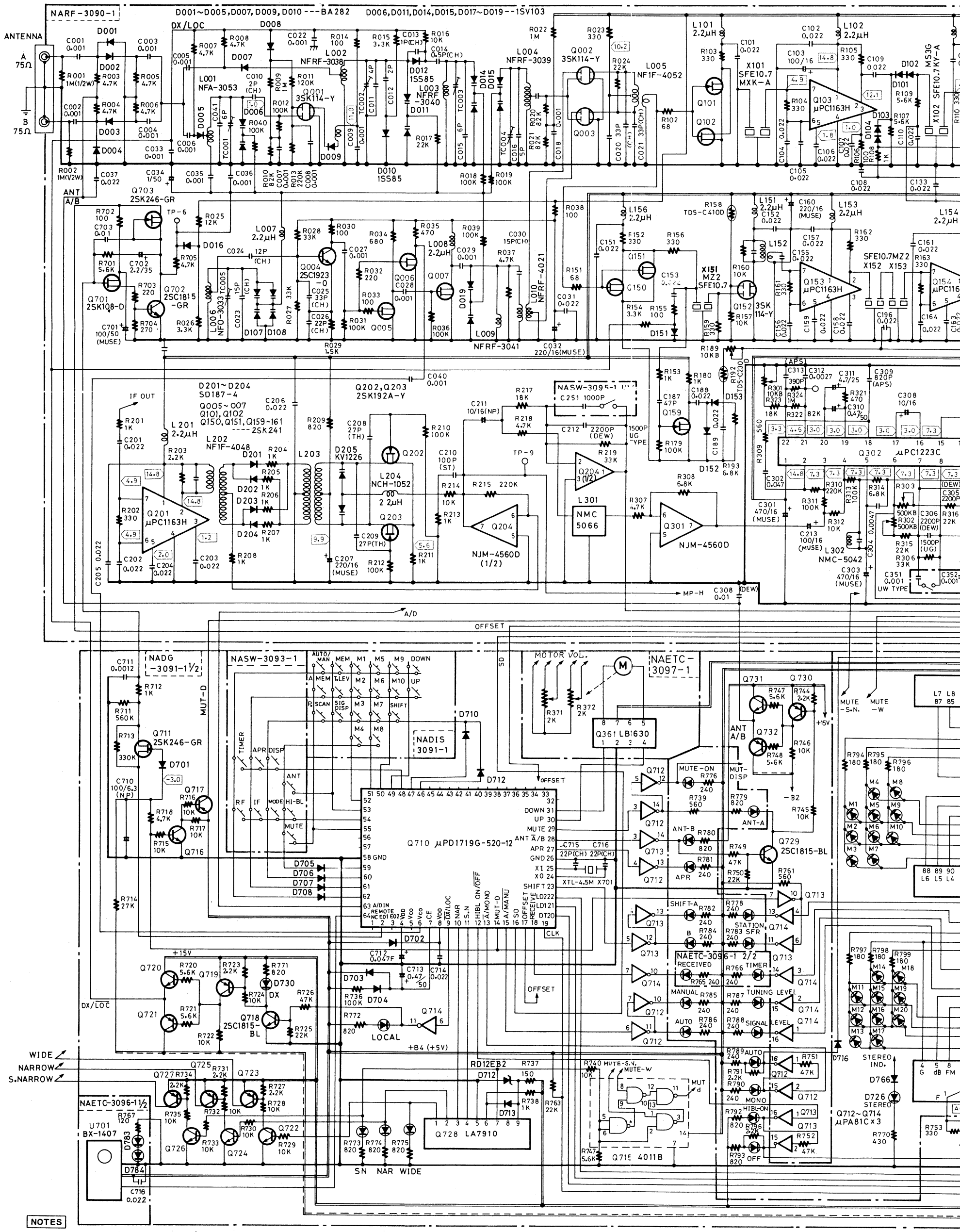
DISPLAY CIRCUIT PC BOARD (NADG-3092-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICS	
Q751, Q752	2227701	μPD6320GC
	FLUORESCENT TUBE	
Q753	212048	FIP12AMW7S
	LAMP	
Q754	210064A	PL6.3V, 250mA

CIRCUIT NO.	PART NO.	DESCRIPTION
	L.E.DS	
D721-D724	225137CG,	SEL2413ECG,
D727, D728	225137DG or	SEL2413EDG or
D730, D731	225137DY	SEL2413EDY
D733, D735	225137CG,	SEL2413ECG,
D737	225137DG or	SEL2413EDG or
D739-D765	225137DY	SEL2413EDY
D725, D726	225142	SEL2913K
D729, D732	225142	SEL2913K
D734, D736	225142	SEL2913K
D738	225142	SEL2913K
	DIODE	
D766	223163	1SS133
	SWITCHES	
S701-S719	25035548	NPS-111-S510
	HOLDERS	
	27190561A	L.E.D
	27190500	Lamp

OMKY-00416 / DRUCK3

SCHEMATIC DIAGRAM



NOTES

- THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR SAFETY. REPLACE ONLY WITH PART NUMBER SPECIFIED.
- VOLTAGE (MEASURED WITH V.T.V.M.) ▭ V IS DC VOLTAGE. (NO INPUT SIGNAL)
- ELECTROLYTIC CAPACITORS (⊕⊣⊖) ARE IN μF/WV.
- ALL CAPACITORS ARE IN μF/50WV UNLESS OTHERWISE NOTED.
- ALL RESISTORS ARE IN OHMS 1/4 WATTS UNLESS OTHERWISE NOTED.
- ALL DIODES ARE IS2473, 1S2076, US1040 or 1SS133 UNLESS OTHERWISE NOTED.
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.

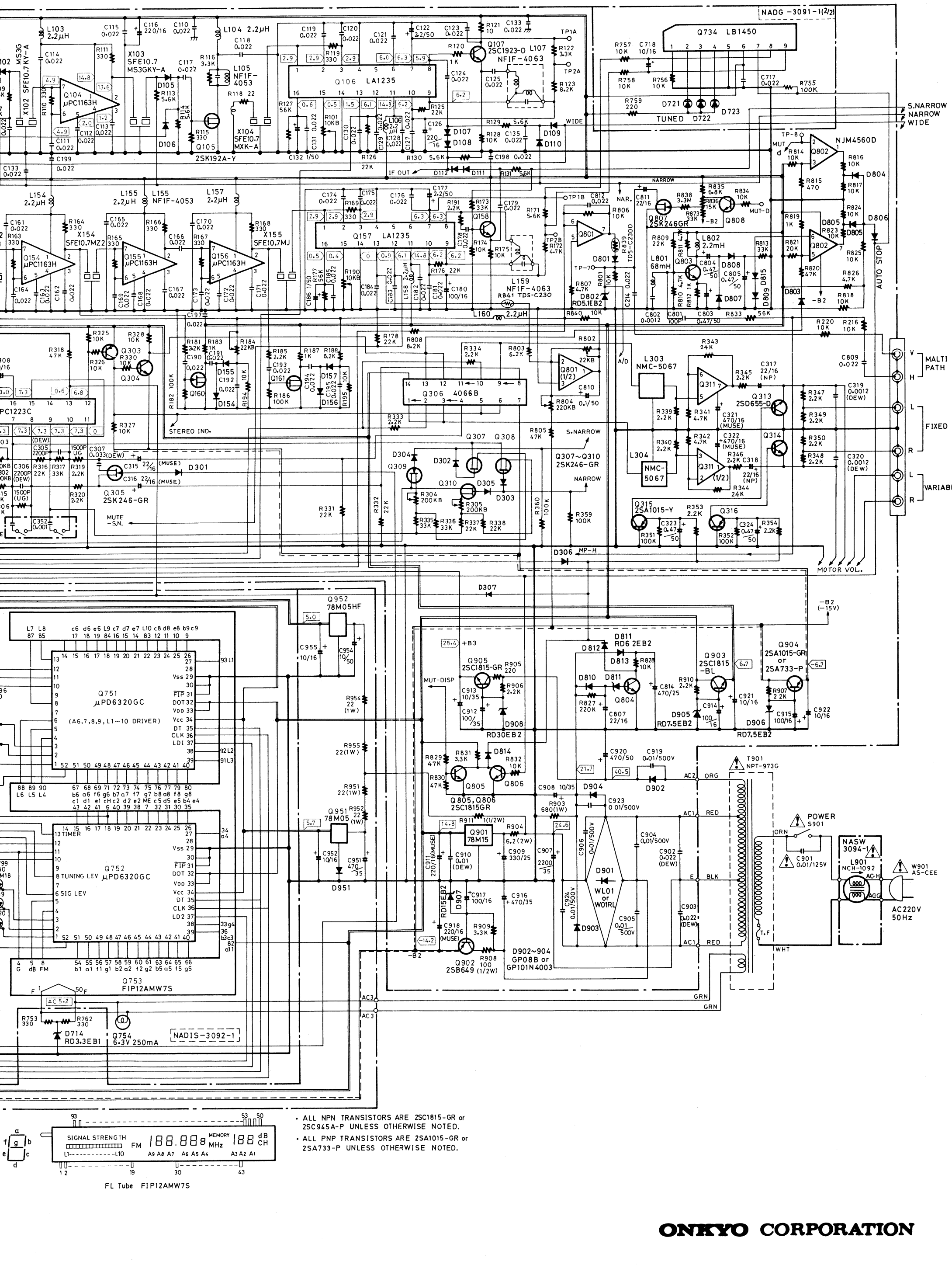
LED : D721~724,727,728, D730,731,733,735, D737,739,740~765 } SEL2413E (GREEN)

D725,726,729,732, D734,736,738,781, D782~784 } SEL2913K (ORANGE)

D781 ---------- SEL2213C (RED)

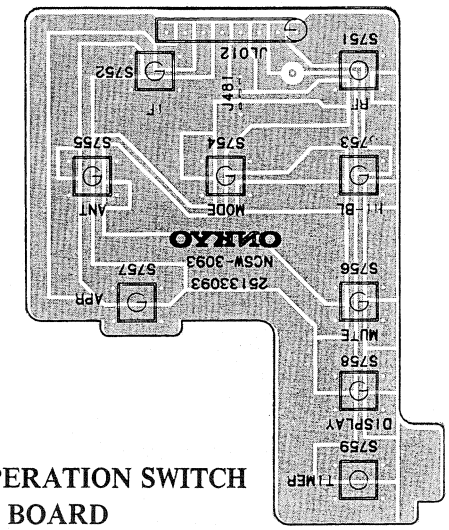
TIMER D782	S'ATION D763	TUN.L. D764	SIG.L. D765	AUTO D724	STEREO D726	APR D728	WIDE D733	HIBL-OFF D735	AUTO D737	ANT-A D739	LOCAL D729
RECEIVED D781	▷ D721	□ D722	◁ D723	MANUAL D725	MUTE D727	S.NAR D734	NARR D732	HIBL-ON D736	MONO D738	ANT-B D740	DX D730
SHFT-A D741	M1 D743	M2 D744	M3 D745	M4 D746	M5 D747	M6 D748	M7 D749	M8 D750	M9 D751	M10 D752	SFR D731
B D742	M11 D753	M12 D754	M13 D755	M14 D756	M15 D757	M16 D758	M17 D759	M18 D760	M19 D761	M20 D762	

6 | 7 | 8 | 9 | 10 | 11

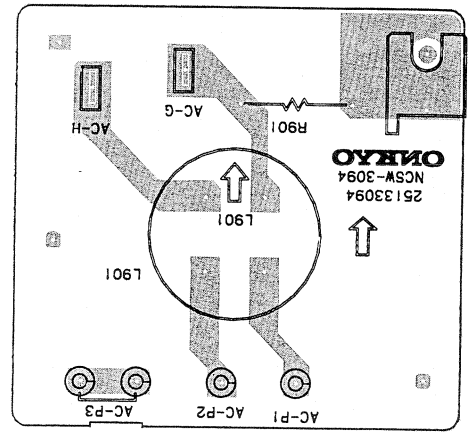


FL Tube FIP12AMW7S

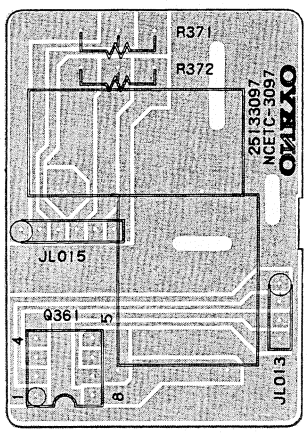
- ALL NPN TRANSISTORS ARE 2SC1815-GR or 2SC945A-P UNLESS OTHERWISE NOTED.
- ALL PNP TRANSISTORS ARE 2SA1015-GR or 2SA733-P UNLESS OTHERWISE NOTED.



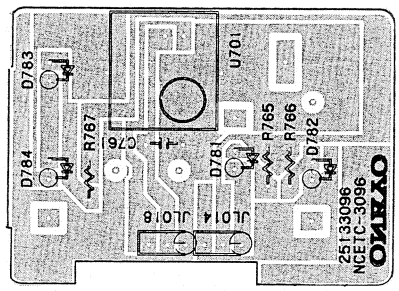
OPERATION SWITCH
PC BOARD



POWER SUPPLY CIRCUIT
PC BOARD



OUTPUT VOLUME
PC BOARD



REMOTE CONTROL
CIRCUIT PC BOARD

OPERATION SWITCH PC BOARD (NASW-3093-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
S751-S759	25035548	NPS-111-S510, Push switches

POWER SUPPLY CIRCUIT PC BOARD (NASW-3094-1A)

CIRCUIT NO.	PART NO.	DESCRIPTION
L901	231051	NCH-1092, Choke coil

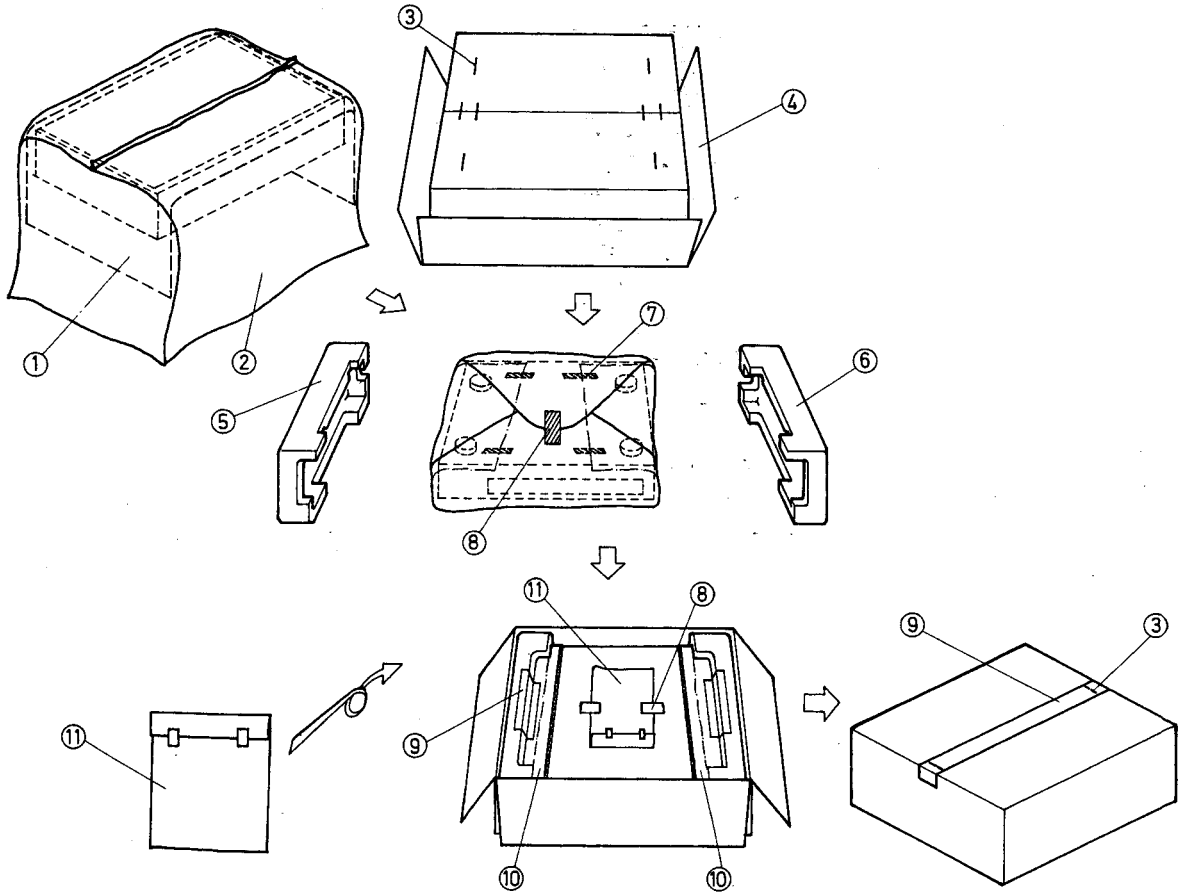
REMOTE CONTROL CIRCUIT PC BOARD (NAETC-3096-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
U701	241068	BX-1407, IC, Remote control receiver section
D781	225141	SEL2213C, L.E.D
D782-D784	225142	SEL2913K, L.E.Ds
	27190562A	Holder, L.E.D

OUTPUT VOLUME PC BOARD (NAETC-3097-1)

REF. NO.	PART NO.	DESCRIPTION
Q361	222963	LB1630, IC, motor driver
R371	5104211	N16RGL2KA30, Variable resistor, Volume

PACKING VIEW



REF. NO.	PART NO.	DESCRIPTION
1	29095318	500 X 800mm, Protection sheet
2	29100038A	720 X 950mm, Poly-vinyl bag
3	282301	Sealing hook
4	29051605	Master carton box
5	29091197	Pad R
6	29091196	Pad L
7	262037	200mm, Drafting tape
8	261504	30mm, Tape
9	260012	100cm, Damplon tape
10	29095491	Aheet P
11	Accessary bag ass'y	

REF. NO.	PART NO.	DESCRIPTION
	2010097	Connection cord
	24140013	RC-113T, Remote control unit
	25060088	Two adaptors for FM antenna
	291064A	FM antenna
	29341193	Instruction manual
	3010054	UM3, Two batteries
	29365020	Warranty card
	29100097	250 X 350mm, Poly-vinyl bag
	29341059	Instruction manual for side panel
	838440089	4TTB + 8C (BC), Four tapping screws for top cover
	29100026	Poly-vinyl bag for tapping screws

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